Covering letter to the PRISM application

Date: 19/11/2022

To:

The TOCIC
IIT Kharagpur
Kharagpur-721302

Sub: Proposal for Development of **Immortals: An Integrated and Portable Health Check-Up Device**

Dear Sir/Madam

I am herewith submitting my application for support under PRISM. The following documents are enclosed.

- Signed Copy of Application
- Proof of Residence: Aadhaar Card
- Innovation: Immortals: An Integrated and Portable Health Check-Up Device
- Work Planned
- Copy of Aadhaar Card

Innovator
Dr. Ayan Chakraborty
Associate Professor, Dept. of Information Technology
Techno International New Town

Government of India
Department of Scientific and Industrial Research
PROMOTING INNOVATIONS IN INDIVIDUALS, START-UPs and MSMEs (PRISM)

PRISM_ Phase-I: Individual Innovator Proposals

Category I: Proof of Concept/Prototypes/Models

Application Form

- Title of the proposed project: Immortals: An Integrated and Portable Health Check-Up Device

- a. Name of the applicant : Dr. Ayan Chakraborty
  b. Father's name/Husband's name: Sri Rathindra Narayan Chakraborty
  c. Postal Address:

d. Address of Institute/Organization: Techno International New Town
DG 1/1 Mega City, New Town
Kolkata 700156

(For Students and working Innovator, No Objection Certificate from Head of Institute /Organization is required)

e. Profession of the applicant ~~Housewife Student Farmer~~
(Please tick ✓as applicable) Any other _ Faculty_ _ _ _ _ _ _ _ _ _ _ _
(specify)

f. Date of Birth: _ 82/09/11_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
YY/MM/DD

g. Educational qualification: _ _ _ PhD_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

h. Annual Income of the applicant: INR. 1236000/-
(If you are an Income Tax Payer, please provide your PAN No. and attach a copy of the latest Income Tax Returns you filed)

- PAN No.- AJMPC3881E

j. Aadhaar No. – 2030 4263 5389

3. Brief description of the idea highlighting innovative element.
(Please use a separate sheet)

Abstract

Researchers realize the potential of technology to smartly and efficiently work out and replace the existing system that defines the present landscape of patient-doctor interaction. A reliable system is the call in this era of technological revolution which eases the efforts that need to be undergone to accomplish a task which can be achieved in just a few seconds; a platform where patients can access their records,

test reports and doctors can monitor their schedules and so on. Not only this, users are subject to witness a whole new approach of the application of technology in day-to-day life. Therefore, we propose to provision a platform: **Immortals** using the perfect combination of the right technologies, and redefine patient-doctor interaction.

Overview

We aim to propose a system that exclusively works for narrowing down the number of processes required to fulfill a task and in some cases, distance as well; thus saving time to either party, setting convenience as the foremost priority. The users have the privilege to make the best out of the portal without the fear of their data being defenseless and vulnerable to threats. **Immortals**' unique features are designed in such a way that any user holds the authority over his/her own data with an option to retrieve and share it across the network, hence maintaining privacy while interacting.

The users are classified as: **Doctors**, **Patients** and **Assistant** (as authorized by the hospitals or medical institution). Each of the kinds of users would enjoy the features of the portal according to their specific type and selection must be done properly.

Doctor: This section of users is for those who are licensed medical practitioners and provides real time data related to their patients. As likely it seems to be, the doctors are supposed to sign up on the platform by providing their credentials and set their own unique IDs and passwords and submit to create an account. This unique ID and password are now the mandatory requirements to login into **Immortals.**

The Doctors, through our application will be able to do the following jobs:

- Upcoming appointments at the instance of the day and the forthcoming weeks can be seen.
- After selecting the occurrence of a particular appointment, the doctor can see the patient's ID and edit his/her details along with medical records, reports etc.
- Doctors can even upload their documents/certificates that ensure the patients as well as the management the authenticity of the practitioner.

Patient: This section, as the name suggests, is for those who wish to visit a particular doctor at a medical institution, where he/she can have access to their records and reports, book appointments etc. The patient too registers on **Immortals**

by filling up the columns with an option to upload his/her earlier medical documents and reports. These records are now secured and can be shared with the doctors/medical experts with the patient's consent. The patients also enjoy a number of enhanced and unique features that allow them to:

- Receive immediate response to any query or aid in medical situations or circumstances regarding their medical conditions in the best possible way.
- Patients can choose the day of visiting the practitioner and book an appointment.
- They can have access to all the medical records namely: previous prescriptions and audio links of their whole discussion with the doctors by just scanning a QR code embedded on their prescriptions.
- The system is well designed to support one in case of emergency situations in order to obtain first aid.
- Review and retrieve the medical reports anytime-anywhere.

Assistant: The assistant comprises of every third person who has been authorized by the medical institution as a recognized and trusted user to manage and hold the responsibility of dealing with the database system. The sign up on the assistant's interface is similar to other forms with some dissimilarities and accesses. The assistant is supposed to be assured genuine by the medical institution to honor security concerns.

All kind of users enjoy complete control of their accounts and related data which can be only be shared when the respective user authorizes the activity on its own.

- (a) Status of work already carried out (if any) such as

  participation in competition
  making a model
  provisional application for patent
  paper presentations
  publication
  college project
  Any other

(b) Science and working principle behind the idea

Model Description

The model is deeply aware about the need of a convenient and trustworthy platform that doesn't involve complex jargon of steps and provides a simple and time saving UI to deal with the system. Nonetheless, the application is equipped with an innovative technological approach that sets it apart and is open to all kinds of modifications that might be desired in the forthcoming.

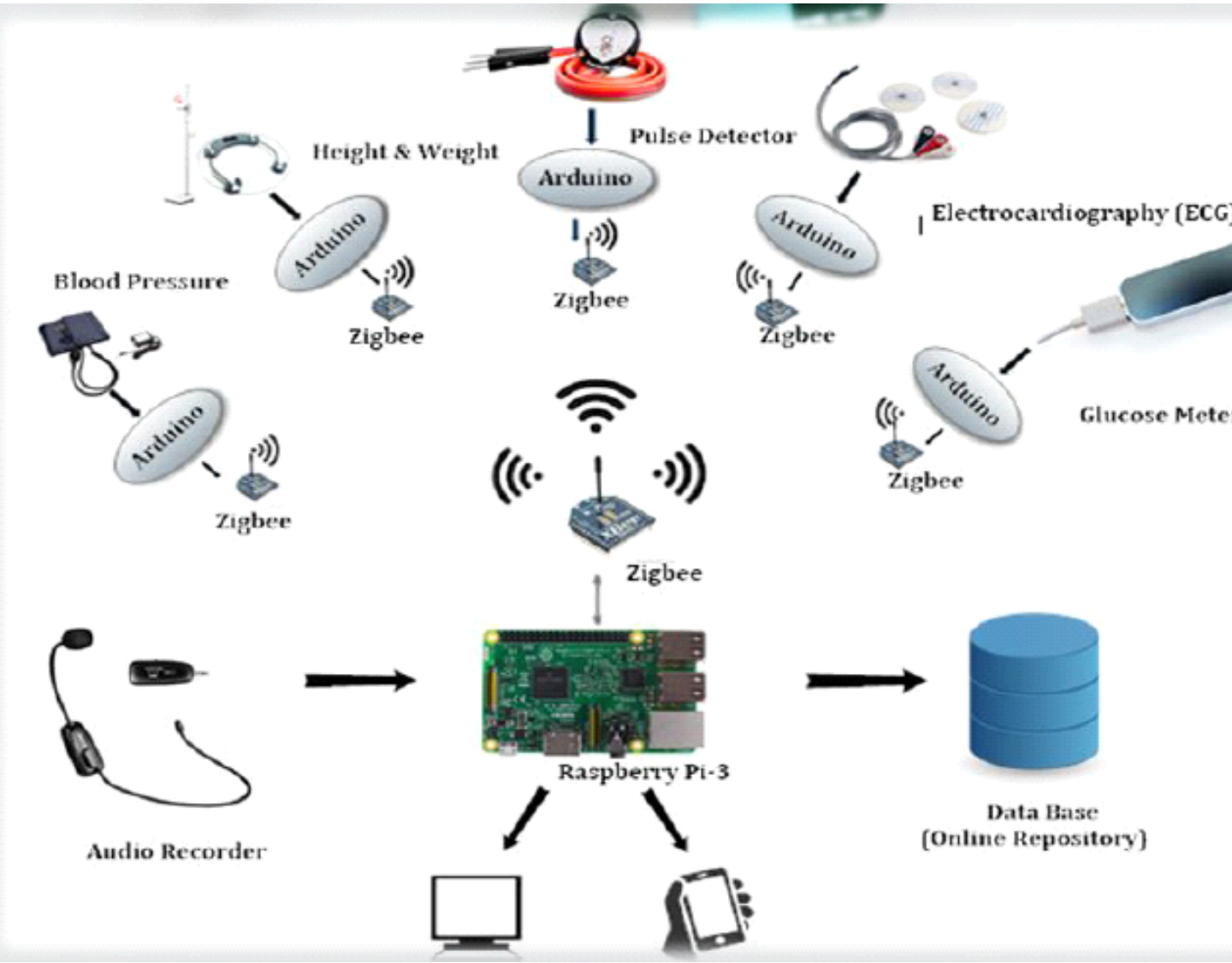

Fig.1. Hardware Assembly

Hardware Assembly

- **Peripheral Devices in use**

Most of the time a patient visits a medical institution, basic body parameters like height, weight, blood pressure and pulse rate etc. are measured and recorded manually which is a time taking and cumbersome process. Therefore, we are putting forward a proposition by combining a number of devices that fulfills the demands with the supply of the proper tools and automates the system thus consuming less human effort and that too in an organized form.

Height & Weight

We measure the height and weight of a patient with the Height Sensor and Load Cell respectively:

- The height sensor is connected to the ultrasonic sensor which is further connected to Arduino that generates data of the height units of the patients.

- A combination of four load cells are used to measure the weight of the patient and the concerned data are transferred to the connected Arduino.

Pulse Rate

Pulse Sensor is a plug-and-play heartbeat rate sensor for Arduino. Pulse sensor is capable of handling noise and avoiding its intervention in the hardware. It is noticeably faster and easier to get reliable pulse readings.

Blood Pressure

The blood pressure sensor is a non-invasive sensor designed to measure human blood pressure. It measures systolic, diastolic and mean arterial pressure utilizing the oscillometric technique.

Blood Glucose Measurement

A glucose monitoring sensor is used to measure the concentration of blood glucose and is a key glucose monitoring device.

ECG (Electrocardiography)

The ECG monitoring sensor module is a cost-effective board used to measure the electrical activity of the heart. This electrical activity can be chart as an ECG or Electrocardiogram and output as an analog reading.

- **Central Hub Configuration**

The central hub consists of a Raspberry PI module integrated with Zigbee to which a number of different modules can be connected. The framework is certainly designed to support more number of device connections than the number of connections in the proposed idea. The central hub is the commanding unit of the entire schema which is responsible for smartly carrying out of arguments dynamically and without misinterpretation of instructions. The peripherals connected to the central hub are regulated in such a way that each of the devices are responsive in real time.

- **Connectivity of the Peripheral Devices with Central Hub**

In each and every module, the devices are connected to their corresponding counterparts of the modules and data is fetched, recorded and retrieved dynamically using Zigbee via Arduino.

- Zigbee is a low-power, low data rate, and close proximity (i.e., personal area) wireless ad hoc network. These are expensive and simpler but can transmit data over long distances by passing data through a mesh network of interconnected devices to reach the central hub.
- Looking into the network and respective dimensions of connections, an intelligent system is configured by Arduino which is capable of automatically communicating with the Raspberry PI as well as detecting and interacting with other devices of the module.
- Each module participates in routing by forwarding data for other modules. So, the determination of which module forwards data is made dynamically on the basis of network connectivity and routing algorithm in use.

After retrieving data, the retrieved data is stored in the database from where the patient's and the doctor's database is updated for generation of prescription(s) as well as for future reference(s).

- **Power Consumption**

Keeping in mind to avoid the excess use of power, we have chosen the devices that consume less power and can operate in quite low voltage. The power consumed by each of the devices are as follows:

Sl. No.	Item	Voltage
1	Blood Pressure Sensor	2.52-3.6 V
2	Electrocardiogram	3.3 V
3	Glucose Meter	3 V
4	Pulse Rate Sensor	3.32 V
5	Ultrasonic Sensor	5 V
6	Raspberry PI	5 V
7	ZigBee	3.3-5 V
8	Arduino	3.3 V

Table 1. Range of power consumption

- **SAR Values**

Sl. No.	**Item**	**SAR**
1	Raspberry PI	1.19 W/kg
2	ZigBee	0.15 W/kg

3	Arduino	0.1436W/kg

Table 2. Range of SAR value

With the above values, we comply by the standards set by the FCC which is 1.6 W/kg in India.

Process Flow

After successfully completing the sign up process, the users are required to proceed as per the specifics designed for each of the kind:

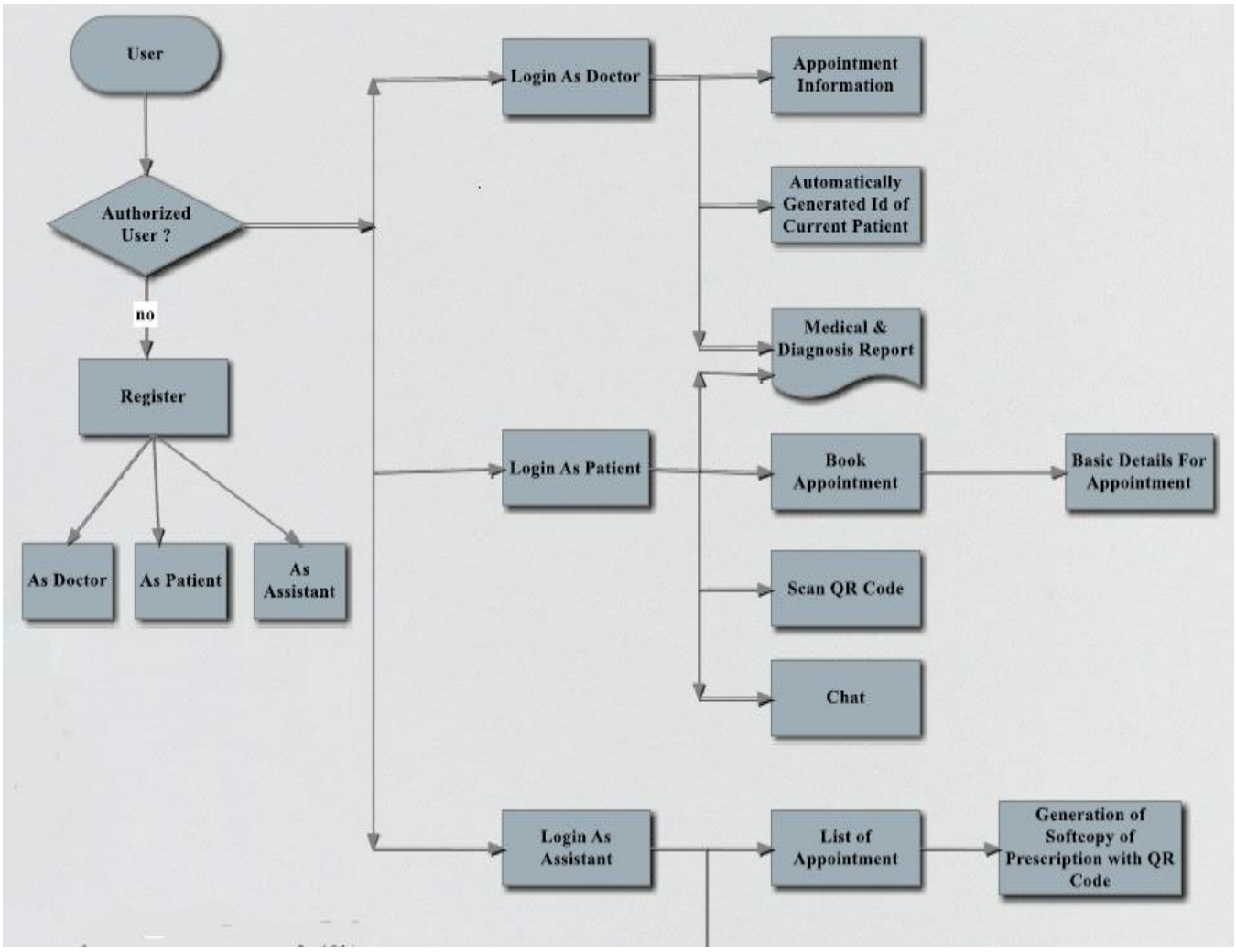

Fig.2. Process flow of the application

- **Patient**

- The Book Appointment tab comes with a mesh-form calendar to ensure easy selection of the desired date to book an appointment at the medical institution with the preferred doctor. Filters are mandatory to be filled in order to narrow down and shortlist the best alternatives. Some of the fields may include: Doctor Name, Date and Time desired, Patient's Name etc.

- The patient needs to be physically present at the same institution to confirm his/her appointment. Failing to do so would result in the dismissal of the appointment scheduled with the doctor.

- A special SMS alert feature keeps the patient regulated and alert to properly abide by the time-table prescribed by the doctor like reminding about medication, diets etc.

- **Assistant**

- Now, the assistant is responsible for generating a computerized blank prescription that contains a QR code enclosing the details of the patients and is configured to carry the links to the audio file and other medical and diagnosis reports in digitized form.

- The generated prescription follows a particular format with the QR code at one corner and is generated afresh on every visit. This means that the patient now holds the same record in two different forms: hard copy (printed) and a soft copy (digital record) with the ability to reminisce every visit with the audio link.

- At the time of appointment, the assistant lists the various patients into a queue on first-come-first-serve basis. It doesn't matter whether the appointment was made at the final moment or planned beforehand. The physical presence at the institution is designed to avoid any inconvenience to either the management or other patients in-line.

- **Doctor**

- The confirmation leads to the generation of a new and unique Patient ID that is listed on the queue as seen by the doctor/medical practitioner in a mesh form. The moment an appointment is successfully confirmed by the assistant and the patient, every other document describing the patient's medical accounts are shared with the doctor/medical practitioner.
- With the start of a session, the audio device attached at constantly close jurisdiction of the doctor and the recorded data is fed to the database via central hub which is then used for linking the files with the QR code.
- **Immortal**'s exclusive ingredient of color coding enables the doctor/medical expert to recognize the chronological aspect of the patients' records which are arranged systematically as folders in the archives.

- **Shared features of Doctors and Patients**

- The medical accounts can be accessed by the patient in the Records section where they can find the reports and other records in a portable document format (PDF) arranged in organized folders.
- To deal with the emergency situations, the chat option connects the patient to any medical expert who shares the space on the platform and is available at the earliest possible instance.
- There is an entire separate division devoted to the test reports and related documents concerned with a particular diagnosis.
- Patients can scan the QR code on their printed prescription(s) and listen to the respective audio link. This QR code, as mentioned before, contains the link to the prescription as well as other records.

Advantages

- Easy and free way of interaction among the medical experts and the patients.
- The availability of every medical document accessible to both: doctors as well as patients at fingertips.

- Easy booking of appointments and monitoring schedules.
- Serving the ability to recall each and every visit by just scanning a QR code.
- Assurance of authenticity and protection of data to either kind of users.
- Quick response scheme to analyze and provide aid in case of emergencies.
- Alerts through SMS regarding their health cares like diet, lifestyle and medication dosage and frequency in the patient doctor visit can be provided.

Future Scope

Immortals is capable of molding itself to overcome any loopholes and adapt modifications required in the future. Indeed the upcoming days are the home to a better version of technology and which would certainly bring a lot of opportunities to make Immortals better and better over time in a cost effective manner. The future is expected to hold the chances of gathering the right tools and include:

- Auto capturing of the key-words from the audio version and subsequently automatic filling up of the computer generated prescription and bills.
- With the help of previous medical data of patient, graph scan be generated using data analytics which will be useful to the doctors for analysis.
- If the government gives the authorization to link the accounts through the Aadhar Card of the individual then various benefits can be availed like:
    - Medical insurance can be claimed easily in case of sudden medical issue.
    - There will be no need of accessing the id, it can be done via the biometric information of the patient retrieved.

(c) Final outcome/deliverable of the project

An integrated microcontroller based portable and scalable electronic platform to collect health statistical data of the patients and generation of medical transcript to store in cloud architecture.

(d) Who would be the beneficiary of this innovation and why?

Beneficiary:

Low cost portable fully integrated health check-up device to solve the medical assistance problems in rural and non-privileged remote areas

where transport and logistics, electricity, internet and medical infrastructures are the challenging issues.

Why?

- Battery/solar operated
- Scalable up to 16 health sensors connectivity
- Real time Result
- Microprocessor controlled
- Strong cloud base support
- Medical transcript generation

5. Proposed costs and time frame

Sl. no.	Items	Project Cost			Remarks
		Own Share	PRISM support sought	Total Cost	
i	R&D/Design Engg / Consultancy	6000	54000	60000	Annexure I
ii	Raw materials/ consumables/ spares	4435	39920	44355	
iii	Fabrication /synthesis charges of working model /process	2200	19800	22000	
iv	Travel (ceiling 5% of approved project cost)	800	7200	8000	
v	Patent filing cost (actual fee paid to patent office)	4000	36000	40000	
vi	Any other	2500	22500	25000	
	Total Cost	19935	1,79,420	199355	

Project period in months: _____12 months_____
(Not more than 18 months)

• Activity details/work plan

Sr. No.	Activities	Monitorable milestones (*Basis : Refer Scope and Support*)	Duration (months)	PRISM Support	Own Support
1	Designing of Central Hub for sensor connectivity	Configuration of Raspberry Pi 3 class B with Libelium IoT Core	6 months	85050	9450
2	Preparing connectivity of Health Sensors	Configuration of Health Sensors	2 months	17820	1980
3	Connectivity with Claud Storage		1 months	28350	3150
4	Installation & Implementation	Rural and Remote area installation for data collection and validation	3 months	31680	3520

7. Have you received financial support / award for your present work from any other sources? *(if so, please furnish details)*

NO

8. **Declaration:**

I declare that all the statements made in this application are true, complete and correct to the best of my knowledge and belief. In the event of any information, found false or incorrect, my candidature will stand cancelled and all my claims will be forfeited. I have not received any financial assistance for the present proposal from any other agency.

Place: Kolkata **Signature of the applicant**

Date: 19/11/2022

9. RECOMMENDATIONS OF THE FORWARDING TePP Outreach Cum Cluster Innovation Centre (TOCIC)

Place: Signature of the Head, TOCIC

Date:

Annexure I

R&D/Design Engg / Consultancy				
1	Research			20000
2	Consultancy			30000
3	Engineering Planning			10000
Raw materials/ consumables/ spares				
Sl No	**Device**	**Quantity**	**Rate**	**Price in Rs.**
1	Raspberry Pi 3 class B	3	3500	10500
2	2C/S2C Series XBee/ZigBee Pro Module with Wire Antenna, TECH1876	6	3000	18000
3	Pulse Detector	3	205	615
4	Height and Weight	3	700	2100
5	Blood Pressure	3	1200	3600
6	Pulse Detector	3	300	900
7	ECG(Electrocardiography)	3	700	2100
8	Glucose Meter	3	500	1500

9	120 Pieces Jumper Wire Set 40 M-M + 40 M-F + 40 F-F Wires	3	250	750
10	400 Tie Points Contacts Mini Circuit Experiment Solderless Breadboard	3	80	240
11	Single Sided Printed Circuit Board (Pack of 5)	3	250	750
12	Soldering Iron & Wire	2	400	800
13	15 Pc 9 VOLTS HW BATTERY with + 15 Pc Connector (Pack of 15) Battery	1	750	750
14	Universal AC to DC Multi Voltage 500 MA Adapter [1.5V 3V 4.5V 6V 7.5V 9V 12V] Power Supply	5	500	2500
Total				44355
Fabrication /synthesis charges of working model /process				
1	PCB Fabrication facility			12000
2	CNC fabrication facility			10000
Travel (ceiling 5% of approved project cost)				
1	Travelling Cost			8000
Patent filing cost (actual fee paid to patent office)				
1	Patent filing cost			40000
Any other				
1	Miscellaneous			25000

Evaluation by Domain Knowledge Experts

1. Name of the Expert :
(e-mail ID, mobile no, contact address)

2. Name of the Innovator :

3. Title of the Proposal :

4. Assessment by the Expert :

	Expert comments
Assessment on merits of idea	
Technological capabilities of innovator to complete the project as projected	
Recommendations to PRISM PASC	

[Signature of Expert with Seal]

No Objection Certificate for the Student /Employee Innovators

The student / employee innovator ---------- is studying /working in our institute/organization since …….. . The institute/organization has no objection to the innovator taking up the innovation work as proposed with financial support under PRISM. The institute laboratories will be made available on chargeable basis to the innovator for executing his/her PRISM project. The Institute/Organization will be responsible for final completion of project in case the Innovator leaves the Institute/Organization without completion of the project.

.....

Competent authority

Signature with Seal

ভারত সরকার

আধার

ভারতীয় বিশিষ্ট পরিচয় প্রাধিকরণ

ভারত সরকার

Unique Identification Authority of India

Government of India

তালিকাভুক্তির আই ডি/Enrollment No.: 1171/04221/00013

To

অয়ন চক্রবর্তী

Ayan Chakraborty

S/O R N Chakraborty

106/E/13 MAHARAJA NANDA KUMAR ROAD

KOLKATA Baranagar

Baranagar Kolkata

West Bengal 700036

25/01/2012

1737/5609

UG173756093IN

আপনার আধার সংখ্যা/ Your Aadhaar No. :

2030 4263 5389

আধার - সাধারণ মানুষের অধিকার

ভারত সরকার

GOVERNMENT OF INDIA

অয়ন চক্রবর্তী

Ayan Chakraborty

জন্ম সাল / Year of Birth : 1982

পুরুষ / Male

2030 4263 5389

আধার - সাধারণ মানুষের অধিকার


आयकर विभाग
INCOME TAX DEPARTMENT
भारत सरक
GOVT. OF IND
AYAN CHAKRABORTY
R N CHAKRABORTY
11/09/1982
Permanent Account Number
AJMPC3881E
Signature